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May 3, 1999

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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51	Life Sciences (General)	1
52	Aerospace Medicine Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.	5
53	Behavioral Sciences Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.	6
54	Man/System Technology and Life Support Includes human engineering; biotechnology; and space suits and protective clothing.	8
55	Space Biology Includes exobiology; planetary biology; and extraterrestrial life.	N.A.

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Typical Report Citation and Abstract

- ❶ 19970001126 NASA Langley Research Center, Hampton, VA USA
- ❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 490)

MAY 3, 1999

51

LIFE SCIENCES (GENERAL)

19990026763 Sternberg Astronomical Inst., Moscow, USSR

How Much Indigenous Material for Construction is Available on the Moon?

Shevchenko, Vladislav V., Sternberg Astronomical Inst., USSR; Workshop on Using In Situ resources for Construction of Planetary Outposts; 1998, pp. 15; In English; See also 19990026739; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche; Abstract Only; Abstract Only

With the use of a remote sensing technique of assessment of surface material properties, the average content of the fine fraction and a relative content of glasses and glassy particles in the local lunar soil for a number of regions has been calculated. From the data it may be suggested that about 50% of the volume of covering material in a number of regions consists of powder-like particles (effective size of particles is about 9 μm). Sintered fine-fraction bricks and blocks could be used in construction. High-Ca lunar fine-fraction bricks could be used as cementitious material needed for the manufacture of lunar concrete. A remote-sensing maturity parameter can serve as a quantitative index of a relative content of glasses and glassy particles in the covering lunar material. The most mature soil (about 80% of agglutinates) has been discovered on about 57% of the nearside of the Moon. Lunar glass composites could be used successfully as construction materials. Concentration of fine-grained metallic Fe increases steadily with increasing maturity. The concentration amounts to about 0.8 wt% for the most mature soils. This easily-produced metallic Fe could be concentrated by magnetic concentrators and separated by melting for use as a construction material. Adopting a value of the relative H content in a rather mature soil, it is possible to determine the relationship between the dimensions of the lunar surface working site to the H mass to be produced. Combined with the assessment of surface material chemical composition, an average O mining possibility can be determined. When lunar O facilities are established, lunar water could be produced by combining lunar O with lunar H (excluding polar regions where water may be extracted from ice areas).

Author

Chemical Composition; Glass; Lunar Soil; Lunar Surface; Moon; Sintering; Water; Construction Materials

19990026877 Ohio State Univ., Research Foundation, Columbus, OH USA

Re-Evaluation of the Role of Starch in Gravitropic Sensing Final Report, 15 Feb. 1995 - 14 Feb. 1997

Sack, Fred D., Ohio State Univ., USA; 1998; 6p; In English

Contract(s)/Grant(s): NAG5-3774; NAGw-4472; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Plant organs grow toward or away from gravity as a way to orient those organs for optimizing growth. Starch has long been thought to be important in sensing the direction of the g-vector in gravitropism, but that hypothesis has also evoked controversy. We have previously shown that starch-deficient mutants of *Arabidopsis* (TC7) and *Nicotiana* (NS458) are impaired in their gravitropism. While this suggests that starch is not necessary for reduced gravitropism, it also indicates that the mass of the starch contributes to sensing when present and thus is necessary for full gravitropic sensitivity. The research supported by this grant focused on three related projects, (1) the effect of light on hypocotyl gravitropism in NS458, (2) the effects of root phototropism on measurements of gravitropic sensitivity, and (3) the effects of starch overproduction on sedimentation and gravitropism. Collectively, our results provide additional strong support for the importance of starch in gravitropic sensing. First, by accounting for negative phototropism in roots of two starchless mutants of *Arabidopsis* we have established that these mutants are much less sensitive to gravity than previously thought. This work also demonstrates the importance of designing experimental protocols that remove the influence of root phototropism on measuring root gravitropism. Second, light apparently promotes gravitropism in starch-deficient *Nicotiana* hypocotyls by increasing the trace amounts of starch in the plastids, by inducing limited plastid sedimentation and thus by presumably increasing the signal provided by plastid mass. and finally, we show that excess starch in *Arabidopsis* seedlings has little effect on gravitropic sensitivity implying that the sensing system is already saturated. However, in light-grown stems

where this mutation results in starch accumulation and where the wild-type practically lacks starch in the sensing cells, the mutant is much more sensitive than the wild-type again showing that the loss of starch depresses gravity sensing.

Author

Gravitropism; Mutations; Phototropism; Plants (Botany); Starches

19990027040 Department of Energy, Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC USA

Enzyme catalysts for a biotechnology-based chemical industry *Quarterly Report, 1 Apr. - 1 Jul. 1998*

Arnold, F. H., Department of Energy, USA; Jul. 08, 1998; 6p; In English

Report No.(s): DE98-007438; DOE/CH/10578-T3; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The goal of this research is to engineer enzymes to be efficient and economically attractive catalysts for the chemical industry. The author is attempting to demonstrate generally-applicable approaches to enzyme improvement as well as develop specific catalysts for potential industrial application. Progress on three tasks are described: Random mutagenesis of pNB esterase-- improved activity and stability; Directed evolution of subtilisin E to enhance thermostability; and Methods for in-vitro recombination.

NTIS

Enzymes; Catalysts; Research; Bioengineering; Chemical Engineering

19990027147 Department of Energy, Office of Energy Research, Washington, DC USA

Biochemistry and genetics of autotrophy in Methanococcus *Progress Report*

Whitman, W. B., Department of Energy, USA; Dec. 31, 1998; 14p; In English

Report No.(s): DE98-007374; DOE/ER/20158-T1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In the last two years of this research, the most exciting results have come from the work on the genetics of methanococci. First, the author demonstrated that the cryptic plasmid from *Methanococcus maripaludis* C5, pURB500, could be transformed into *Methanococcus maripaludis* JJ. Strain JJ is the type strain of *M. maripaludis* and has only about 65% DNA:DNA hybridization to strain C5. Because of the low relatedness of these strains, it was not obvious that pURB500 could be transferred between them. This goal was achieved by first transforming strain C5 with a series of suicide plasmids containing the pac cassette, which possessed the selectable puromycin resistance marker, and different cloned fragments of pURB500. From the puromycin-resistant transformants, a plasmid was isolated that transformed strain JJ. However, when this plasmid was electroporated into *E. coli*, only rearrangement products were obtained that contained small portions of the original pURB500. These plasmids no longer transformed *Methanococcus*. While these experiments did not yield a shuttle vector, they demonstrated that pURB500 could replicate in strain JJ.

NTIS

Biochemistry; Research; Genetics; Escherichia

19990027148 National Biomedical Research Foundation, Washington, DC USA

Georgetown Institute for Cognitive and Computational Sciences *Final Report, 30 Sep. 1993 - 30 Sep. 1998*

Ledley, Robert S.; Nov. 1998; 140p; In English

Contract(s)/Grant(s): DAMD17-93-V-3018

Report No.(s): AD-A359604; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

GICCS is a multidisciplinary neuroscience research institute whose mission is to understand higher cognitive function-both under normal and pathological conditions. Its major focus areas are: higher auditory processing and language; brain injury and plasticity; computational neuroscience; and drug discovery. GICCS faculty have continued to elucidate the complex mechanisms of higher auditory processing in experimental animals, from bats to primates. Parallel research in humans, using functional brain imaging and cognitive psychology, examines how the human brain deals with complex sounds, particularly those relating to speech. These studies address not only normal language processing but also examine disorders of speech/language, including developmental and acquired dyslexias. Investigators also use tools from cellular/molecular neurobiology and from systems neuroscience to study plasticity after acute or chronic brain injury, as well as after early vision or hearing loss. This includes development of novel pharmacological strategies to limit brain damage and to enhance cognitive function after injury or neurodegeneration. Brain magnetic resonance techniques (including functional imaging) are also used. Computational methods are employed to model sensory processing based upon experimental studies. Predictions based upon mathematical modeling are evaluated in subsequent laboratory experiments.

DTIC

Cognitive Psychology; Neurology; Multidisciplinary Research; Neurophysiology; Pharmacology; Animals; Injuries

19990027545 Department of Energy, Office of Energy Research, Washington, DC USA

Why do plants have two pathways of polyamine synthesis *Final Report*

Malmberg, R. L., Department of Energy, USA; May 15, 1998; 7p; In English

Report No.(s): DE98-006361; DOE/ER/20149-T1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The long term goals of this research into polyamine synthesis in plants are to understand the regulation and function of the two alternative pathways to putrescine synthesis. One pathway uses ornithine decarboxylase (ODC); the other begins with arginine decarboxylase (ADC) and continues through agmatine to putrescine. Polyamines likely contribute to a large number of cellular and developmental processes by virtue of being organic carriers of positive charges. A subset of this problem is to understand the relative functions of the ODC and ADC pathways. The author reports here that there are two ADC genes, so one must now also ask what are the relative functions of the different ADC genes. One theme for both ODC and ADC, across many taxa, is post-transcriptional regulation. The research has been directed at examining this as well. While some polyamine mutants exist, particular in single cell model systems, the pathway had not been genetically analyzed in detail in a multicellular eukaryote. The author believes the lack of such mutants has contributed to the confusion about polyamines in plants. The major goal has been to isolate mutants for regulation and function studies.

NTIS

Plants (Botany); Biosynthesis

19990027547 Department of Energy, Office of Energy Research, Washington, DC USA

Cloning and sequencing of the trpE gene from Arthrobacter globiformis ATCC 8010 and several related subsurface Arthrobacter isolates

Chernova, T., Department of Energy, USA; Viswanathan, V. K., Department of Energy, USA; Austria, N., Department of Energy, USA; Nichols, B. P., Department of Energy, USA; Dec. 31, 1998; 23p; In English

Report No.(s): DE98-006375; DOE/ER/61679-T1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Tryptophan dependent mutants of Arthrobacter globiformis ATCC 8010 were isolated and trp genes were cloned by complementation and marker rescue of the auxotrophic strains. Rescue studies and preliminary sequence analysis reveal that at least the genes trpE, trpC, and trpB are clustered together in this organism. In addition, sequence analysis of the entire trpE gene, which encodes component I of anthranilate synthase, is described. Segments of the trpE gene from 17 subsurface isolates of Arthrobacter sp. were amplified by PCR and sequenced. The partial trpE sequences from the various strains were aligned and subjected to phylogenetic analysis. The data suggest that in addition to single base changes, recombination and genetic exchange play a major role in the evolution of the Arthrobacter genome.

NTIS

Cloning (Biology); Sequencing; Genes

19990027549 Department of Energy, Office of Energy Research, Washington, DC USA

DNA Files

Jun. 09, 1998; 7p; In English

Report No.(s): DE98-006393; DOE/ER/62549-T1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The DNA Files is a radio documentary which disseminates genetics information over public radio. The documentaries explore subjects which include the following: How genetics affects society. How human life began and how it evolved. Could new prenatal genetic tests hold the key to disease prevention later in life. Would a national genetic data base sacrifice individual privacy. Should genes that may lead to the cure for cancer be privately owned. This report serves as a project update for the second quarter of 1998. It includes the spring/summer 1998 newsletter, the winter 1998 newsletter, the program clock, and the latest flyer.

NTIS

Deoxyribonucleic Acid; Information Dissemination; Radio Communication

19990027550 Department of Energy, Office of Energy Research, Washington, DC USA

Genome Radio Project *Quarterly Report*

Dec. 31, 1997; 3p; In English

Report No.(s): DE98-006395; DOE/ER/62003-T2; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The DNA Files is now in the production phase. The managing editor, program producers, editors, technical director, research and mixing engineers are in place. All-day meetings were held November 20 through 23 between the producers and core production staff, along with several science advisors, for a combination 'each-in' discussion group and planning/formatting session. Dur-

ing this time, roles were refined and the support system provided for the producers. The meetings were organized to maximize interaction with the experts, so that producers' questions stemming from the reading they had already done could be addressed.

NTIS

Deoxyribonucleic Acid; Radio Communication

19990027551 Department of Energy, Office of Energy Research, Washington, DC USA

Genetic analysis of embryo dormancy Final Report

Galau, G., Department of Energy, USA; Dec. 31, 1998; 7p; In English

Report No.(s): DE98-006404; DOE/ER/20190-T1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Primary dormancy is the inability of mature seed to immediately germinate until specific environmental stimuli are perceived that predict that future conditions will support plant growth and seed set. The analysis of abscisic acid deficient and insensitive mutants, in particular in Arabidopsis, suggests that embryo abscisic acid may be directly involved in the development of primary dormancy. Other studies implicate the continued accumulation of LEA proteins as inhibiting germination in dormant embryos. The results of these physiological, molecular and genetic approaches are complex and equivocal. There is a real need for approaches that test the separate nature of vivipary inhibition and primary dormancy and deliberately seed to decouple and dissect them. These approaches should be of help in understanding both late embryo development and primary dormancy. The approach taken here is to directly isolate mutants of Arabidopsis that appear to be deficient only in primary dormancy, that is fresh seed that germinate rapidly without the normally- required cold-stratification. The authors have isolated at least 8 independent, rapidly germinating RGM mutants of Arabidopsis. All others aspects of plant growth and development appear normal in these lines, suggesting that the rgm mutants are defective only in the establishment or maintenance of primary dormancy. At least one of these may be tagged with T-DNA. In addition, about 50 RGM isolates have been recovered from EMS-treated seed.

NTIS

Genetics; Embryos; Seeds; Vegetation Growth; Plants (Botany)

19990027552 Department of Energy, Office of Energy Research, Washington, DC USA

High performance computing and communications Grand Challenges program: Computational structural biology Final Report, 15 Aug. 1992 - 14 Jan. 1997

Solomon, J. E., Department of Energy, USA; Oct. 02, 1997; 7p; In English

Report No.(s): DE98-006416; DOE/ER/25134-T3; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Grand Challenge project consists of two elements: (1) a hierarchical methodology for 3D protein structure prediction; and (2) development of a parallel computing environment, the Protein Folding Workbench, for carrying out a variety of protein structure prediction/modeling computations. During the first three years of this project the author focused on the use of selected proteins from the Brookhaven Protein Data Base (PDB) of known structures to provide validation of the prediction algorithms and their software implementation, both serial and parallel. Two proteins in particular have been selected to provide the project with direct interaction with experimental molecular biology. A variety of site-specific mutagenesis experiments are performed on these two proteins to explore the many-to-one mapping characteristics of sequence to structure.

NTIS

Molecular Biology; Molecular Structure; Proteins

19990028177 Department of Energy, Office of Energy Research, Washington, DC USA

Partnering for functional genomics research conference: Abstracts of poster presentations

Dec. 31, 1998; 100p; In English

Report No.(s): DE98-054273; ORNL/M-6536; CONF-980479; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This reports contains abstracts of poster presentations presented at the Functional Genomics Research Conference held April 16--17, 1998 in Oak Ridge, Tennessee. Attention is focused on the following areas: mouse mutagenesis and genomics; phenotype screening; gene expression analysis; DNA analysis technology development; bioinformatics; comparative analyses of mouse, human, and yeast sequences; and pilot projects to evaluate methodologies.

NTIS

Genes; Chromosomes; Abstracts; Conferences; Deoxyribonucleic Acid; Gene Expression

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19990027390 Civil Aeromedical Inst., Oklahoma City, OK USA

Preparation of Carboxyhemoglobin Standards and Calculation of Spectrophotometric Quantitation Constants *Final Report*

Canfield, Dennis V., Civil Aeromedical Inst., USA; Smith, Moraine D., Civil Aeromedical Inst., USA; Ritter, Roxane M., Civil Aeromedical Inst., USA; Chaturvedi, Arvind K., Civil Aeromedical Inst., USA; Aug. 1998; 14p; In English

Contract(s)/Grant(s): AM-B-96-TOX-202

Report No.(s): DOT/FAA/AM-98/21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Toxicology and Accident Research Laboratory of the Federal Aviation Administration is required to analyze specimens from all pilots involved in fatal aircraft accidents for the presence of carbon monoxide poisoning, to determine if carbon monoxide caused pilot incapacitation leading to the accident. Therefore, reliable and stable carbon monoxide controls are needed to assure the accuracy of the analysis of carbon monoxide. A method was developed for the preparation of carboxyhemoglobin standards, which were stable for more than 4 months with the prepared control remaining within acceptable limits during this time. A mathematical equation was developed to more accurately determine the constants A and B used in the equation $\text{COHB}\% = 100[(C-B)/(A-B)]$, where B 0% COHB peak ratio at 540nm and 579nm; A = 100% COHB peak ratio at 540nm and 579nm; and C the peak ratio at 540nm and 579nm for the blood being analyzed. The following equations were developed to calculate A and B: $B = [P(\text{sub avg}) - (P * [(P(\text{sub avg}) - N(\text{sub avg})) / (P - N)])]$; A equals $B + (P(\text{sub avg}) - N(\text{sub avg})) / (P - N)$, $P(\text{sub avg})$ = average peak ratio 540/579 for the positive standard run on the spectrophotometer; P = average decimal concentration measured on the CO-OXIMETER for the positive standard; $N(\text{sub avg})$ = average peak ratio 540/579 for the negative standard; N = average decimal concentration measured on the CO-OXIMETER for the negative standard. The new equations provided results consistent with those obtained from a CO-OXIMETER.

Author

Blood; Carbon Monoxide; Carboxyhemoglobin; Oximetry; Spectrophotometry; Calibrating

19990027428 NASA Langley Research Center, Hampton, VA USA

Aerospace Medicine and Biology: A Continuing Bibliography with Indexes, Supplement 488

Apr. 05, 1999; 37p; In English

Report No.(s): NASA/SP-1999-7011/SUPPL488; NAS 1.21:7011/SUPPL488; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report lists reports, articles and other documents recently announced in the NASA STI Database. In its subject coverage, Aerospace Medicine and Biology concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract.

Derived from text

Aerospace Medicine; Bibliographies; Data Bases; Indexes (Documentation)

19990027731 Georgetown Univ., Washington, DC USA

Akamai Network for Diagnosis, Treatment, and Management to Support Telepresence *Annual Report, 31 Aug. 1997 - 30 Sep. 1998*

Mun, Seong K.; Oct. 1998; 253p; In English

Contract(s)/Grant(s): DAMD17-94-V-4015

Report No.(s): AD-A360022; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

The expansion applications of telemedicine are being effectively employed in numerous disciplines from acute care to care of the chronically ill. Critical technological, security and clinical issues must be addressed according to each application's requirements. A pilot study has been underway to examine the impact of home telemedicine for insulin-dependant diabetic patients. Our initial results are very positive, and we plan to increase the number of patients on-line to approximately 30. Needs assessments for telemedicine is an essential incipient step, and such a methodology has been applied to the telemedicine project or the State

Department and a hospice center. We continue to lead the teleradiology applications for deployed environments. Security, a serious concern in the transfer of any electronic data, is being addressed through technological and organizational approaches. Simulation of medical procedures will have a profound impact in the future, especially if controlled remotely. We have initiated prostate biopsy, spine surgery and palpation simulation capabilities that can be remotely controlled for eventual applications of invasive telemedicine. The following manuscripts provide in depth accounts of our progress in telemedicine in 1998.

DTIC

Teleoperators; Telemedicine; Diagnosis; Medical Equipment

19990027797 San Diego State Univ., San Diego, CA USA

Improving Navy Women's Health: Preventing Smoking Relapse After Recruit Training Annual Report, 18 Sep. 1997 - 17 Jun. 1998

Conway, Terry L.; Jul. 1998; 60p; In English

Contract(s)/Grant(s): DAMD17-95-1-5075

Report No.(s): AD-A359632; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Smoking is a modifiable behavior that is negatively related to women's health and physical readiness, and increases the burden on military health care systems. This behavior is of particular concern to the DoD because military women are more likely to smoke than their civilian counterparts and because women have greater difficulty quitting than do men. The present 21/2 year study, funded by the Defense Women's Health Research Program (DWHRP), is testing innovative approaches to reduce smoking among Navy women by evaluating two different relapse-prevention interventions that support maintenance of the "quit status" organizationally mandated during basic training. Women smokers (n = 3,036) were assigned to either a control group or one of two intervention groups at entry into basic training. One intervention group was encouraged to access a telephone helpline for counseling to remain a nonsmoker; the other group received a series of monthly mailings. Analyses of assessments at 3, 6, and 12 months post-graduation are being completed to evaluate the effectiveness of the interventions in maintaining the "cold turkey" smoking cessation induced during recruit training.

DTIC

Navy; Females; Health; Smoke; Prevention

19990028170 Wyle Labs., Inc., San Antonio, TX USA

Research and Development of Advanced Life Support Equipment Final Report, 11 Nov. 1992 - 7 Nov. 1997

Webb, James T.; Feb. 1999; 156p; In English

Contract(s)/Grant(s): F33615-92-C-0018; AF Proj. 7184

Report No.(s): AD-A360455; AFRL-HE-BR-TR-1998-0114; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The purpose of this effort was to provide research and research support to on-going RDT&E efforts in the following areas: The effect of physical conditioning on acceleration tolerance/endurance; Female G tolerance/endurance; Effect of varied periods of acceleration layoff on acceleration tolerance/endurance; Effect of crewmember posture and position on acceleration tolerance/endurance; Use of animal models for human acceleration tolerance/endurance; Life support equipment development laboratory; Testing of life support equipment, subatmospheric research; Molecular sieve technology; Spatial disorientation (SD) countermeasures research; Sustained operations research; Biomedical laboratory operation and support; and Task order requirements. This final report provides summaries and accomplishments including citations and abstracts for the publications documenting the results of the specific efforts.

DTIC

Acceleration Tolerance; Life Support Systems; Human Tolerances; Physiological Factors; Operations Research

53

BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

19990027083 Institute for Human Factors TNO, Soesterberg, Netherlands

Effects of Three-Dimensional and Mono Auditory Information on Flight Performance Final Report Het effect van drie-dimensionale en mono geluidsinformatie op de vliegprestatie

Veltman, J. A., Institute for Human Factors TNO, Netherlands; Wertheim, A. H., Institute for Human Factors TNO, Netherlands; Oving, A. B., Institute for Human Factors TNO, Netherlands; Sep. 17, 1998; 20p; In English; Original contains color illustrations

Contract(s)/Grant(s): A97/KLu/308; TNO Proj. 788.1

Report No.(s): TD98-0262; TM-98-A052; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, P.O. Box 23, 3769 ZG Soesterberg, The Netherlands), Hardcopy, Microfiche

It is possible to present auditory information in ear phones in such a manner that the spatial position of the sound source appears to remain fixed in external space, irrespective of how the listener moves his or her head. In the present experiment it was investigated whether such a virtual spatial sound presentation in a cockpit has advantages over the traditional mono sound presentation. The experiment concerned auditory presentation of directional information, related to anti collision radar (TCAS) or to mechanical failures in either one of the two engines or wings. This information was presented in addition to the standard displays on which these warnings appeared. Subjects (student pilots) had to react to the warnings while flying a civil aeroplane in a flight simulator with a wide field outside image. The experiment was carried out in two flight conditions, differing with respect to visual load. The results showed that 3D warnings, added to already present visual warning messages, yielded faster reaction times in the more visually loaded flying conditions. The effects were not as obvious in error rates, in flying performance, or in measures of subjective task load. A follow up experiment is proposed in which the flying task is made more demanding and in which the visual display on which the mechanical failure warnings are presented is placed in a more peripheral position (as is the case in actual cockpits). It is expected that in such conditions advantages of 3D audio information presentation will become more pronounced.

Author

Display Devices; Three Dimensional Models; Flight Characteristics; Failure; Ear

19990027096 Institute for Human Factors TNO, Research Inst., Soesterberg, Netherlands

Effect of Three-Dimensional and Mono Auditory Information on Performance in Cockpit Warning Tasks *Interim Report Effecten van Drie-Dimensionaal en Mono Geluids-informatie op de Prestatie ten Aanzien van Waarschuwingen in de Cockpit* Oving, A. B., Institute for Human Factors TNO, Netherlands; vanBreda, L., Institute for Human Factors TNO, Netherlands; Werkhoven, P. J., Institute for Human Factors TNO, Netherlands; Sep. 21, 1998; 27p; In English; Original contains color illustrations Contract(s)/Grant(s): A97/KLu/307; TNO Proj. 788.1

Report No.(s): TD98-0264; TM-98-A054; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 de Soesterberg, The Netherlands), Hardcopy, Microfiche

The potential benefits of a three-dimensional (3D) auditory display in conveying directional information were investigated in a flight simulation experiment. The study was aimed at the application of 3D audio in the cockpit of civil aircraft. Participants were required to follow a specific flight path in a runway approach. Standard cockpit information was available on a set of visual displays, i.e., primary flight information, flight path and tracking information, traffic alert and collision avoidance information (TCAS) and on-board systems status information. In the experiment, additional auditory directional information was presented for TCAS-warnings or for warnings of system failures in the aircraft. In case of a TCAS-warning, participants were required to identify the specific orientation of the target aircraft with respect to the outside world. In case of a failure warning, participants had to indicate the location of the failure in the aircraft itself. Warnings were always presented both aurally and visually. There were four conditions for the presentation of directional information in the aural warnings: mono-sound with or without verbal directional statements and 3D-sound with or without verbal directional statements. The verbal directional statements in the TCAS-warning referred to a specific quadrant of the outside world in the TCAS task (e.g., lower quadrant left) and to the specific side of the aircraft for system failures (e.g., left-hand or right-hand side). The 3D auditory display used a head-tracking device to make the external position of the source invariant under head movements. In all conditions, directional information for the warnings was presented on a visual display as well. Results showed that for the TCAS task and the failure task, addition of directional information (i.e., 3D-sound or verbal directional information) resulted in significantly reduced response times. The response times were shortest when both types of directional information were combined in the TCAS-warning. For the system failure task, only the differences between the response times in the mono-without condition and the three other conditions proved to be significant.

Author

Cockpits; Three Dimensional Models; Performance Prediction; Display Devices; Research; System Failures; Failure; Warning Systems

19990027832 Naval Aerospace Medical Research Lab., Pensacola, FL USA

Probability of Success in Primary Flight Training as a Function of ASTB Scores and API Grades: An Example of the Statistical Inferencing Component of the Pilot Prediction System

Blower, David J.; Nov. 30, 1998; 19p; In English

Report No.(s): AD-A360571; NAMRL-1404; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Pilot Prediction System (PPS) is a research effort designed to provide Navy managers and other decision makers with improved access to selection and training data. Many disparate data bases, each containing partial and sometimes overlapping

information on selection data and training performance, currently exist. There has been no attempt to coordinate the bits and pieces gathered into these local databases into a coherent whole. Such data needs to be merged and the anomalies excised so that a more global picture of selection data and training performance can emerge. In addition, the targeted users of the PPS should be shielded from the low-level technicalities of the data base because such technical details are of no concern to them. For the same reason, the statistical manipulations that provide extrapolations from the data base to new cases can be hidden from view. This report documents the first efforts at constructing the statistical modeling component of the PPS as derived from Bayesian statistical decision theory. It enables the potential user of the PPS to predict success in primary flight training for flight students based on their scores on selection tests and ground school performance.

DTIC

Data Bases; Flight Training; Data Acquisition; Scoring; Management; Probability Theory; Statistical Decision Theory; Armed Forces

54

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19990026743 Los Alamos National Lab., NM USA

Construction of Planetary Habitation Tunnels Using a Rock-Melt-Kerfing Tunnel-Boring Machine Powered by a Bimodal Heat Pipe Reactor

Blacic, James D., Los Alamos National Lab., USA; Houts, Mike G., Los Alamos National Lab., USA; Blacic, T. M., California Univ., USA; Workshop on Using In Situ resources for Construction of Planetary Outposts; 1998, pp. 2-3; In English; See also 19990026739; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche; Abstract Only; Abstract Only

Significant manned exploration and support activities over extended periods on planetary surfaces such as the Moon or Mars will require space radiation shielding of habitats and laboratories. As habitat volumes grow, it will soon become cost effective in structural mass import and extravehicular activity (EVA) time to construct habitable volumes directly underground in the form of gas-tight tunnels incorporating many meters of overburden shielding. We have previously proposed that an effective concept for constructing such tunnels is a tunnel-boring machine (TBM) design that combines conventional rotary (auger) cutters with rock-melting kerf heaters, the latter to control the tunnel gauge dimension in poorly consolidated rock and provide support for the opening. Advantages of this approach are (1) no fluids are needed to transport cuttings and (2) tunnel support in the form of a strong, impermeable glass lining is automatically formed as the TBM advances. The kerf heaters melt poorly cemented regolith rock on the tunnel boundary and consolidate the glass into a formed-in-place lining that, once cooled, is very strong and orders of magnitude less permeable; residual cooling cracks in the glass are sealed with indigenous metals using an integrated plasma spray gun. The resulting tunnel is sufficiently strong and gas-tight to allow normal pressurization for habitation, and is constructed entirely of in situ materials. A key technology needed to make the TBM design practical for space use is a robust, low-mass power supply. Recent design of a heat pipe-cooled, bimodal (thermal and electric power) fission-reactor power system (HPS) is well matched to this application. The core of the HPS is cooled by passive Li metal heat pipes that can deliver 100-1000 kW thermal power at 1800 K to the kerf-melting bodies of the TBM (recently, a Mo/Li heat pipe HPS module was fabricated and performed well in electrically heated tests to 1400 K with multiple restarts). Using one of a number of possible conversion methods, a portion of the reactor heat can also be used to generate several tens kW of electrical power for the rotary cutters and muck conveyors. Residual waste heat after electrical conversion is disposed of in the cuttings that are conveyed out of the tunnel. We project that a mostly automated, melt-kerfing TBM with this power system can produce sealed habitation tunnels, 3-5 m in diameter, in planetary regolith materials at a rate of about 8 m length per day. A 3-m diameter habitat would require a reactor generating power of about 500 kWt and 25 kWe. Additional features of the HPS are that it can be asymmetrically cooled to provide a TBM steering mechanism by asymmetric kerf heating, and it can be completely proof-tested using only resistance heaters.

Author

Boring Machines; Planetary Composition; Radiation Shielding; Mars (Planet); Mars Bases; Tunneling (Excavation); Underground Structures; Melting

19990026744 Guppy Research, Inc., Provo, UT USA

Obtaining and Utilizing Extraterrestrial Water

Buehler, David, Guppy Research, Inc., USA; Workshop on Using In Situ resources for Construction of Planetary Outposts; 1998, pp. 3-4; In English; See also 19990026739; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche; Abstract Only; Abstract Only

As an in situ resource, water has no rival in terms of sheer usefulness for space operations. It can be used for life support, propulsion, radiation shielding, and structure. This paper describes a low-cost system for transporting water back from water-bearing bodies such as extinct short-period comets, carbonaceous asteroids, or possibly the moons of Mars. It is likely that water will be of most benefit initially as a propellant feedstock in low Earth orbit. Several ways to use the water are discussed, including a space-based stage to assist in putting mass into orbit and a propellant ladder for lifting mass higher in the Sun's gravity well. A composite material of ice and fiberglass is discussed as a possible load-bearing structural material. A preliminary analysis of the economics of the water extraction/transportation system suggests it may be economically viable in the near-term. An initial system would require about 70 T of equipment and propellant be lifted into low Earth orbit.

Author

Ice; Life Support Systems; Propellants; Transportation; Water; Extraterrestrial Resources; Construction Materials; Spacecraft Propulsion

19990026748 Colorado State Univ., Dept. of Civil Engineering, Fort Collins, CO USA

Habitat Construction Requirements

Criswell, Marvin E., Colorado State Univ., USA; Workshop on Using In Situ resources for Construction of Planetary Outposts; 1998, pp. 5-6; In English; See also 19990026739; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche; Abstract Only; Abstract Only

Human-occupied habitats on either the Moon or Mars will need to make the maximum practical use of in situ resources for reasons of overall mission economy and because of transportation limitations. How the in situ resources can best be used, and to what extent they may be used, will depend on several factors, including the basic structural demands of the habitat, the maturity of the habitat and associated mission, manufacturing and construction support needed to use the material, and the degree the habitat use of such material fits with base capabilities to process such in situ material for other base and mission requirements. Habitats on either the Moon or Mars must contain, with minimum leakage and a high level of reliability, a life-supporting artificial atmosphere that allows its human occupants, along with plants and other living components of its life support and food system, to survive and thrive. In the reduced gravity environment of either site, the internal pressure of the needed atmospheric gases will dominate the structural loading of the operational habitat, even if a several meters-thick layer of mass shielding is placed atop the habitat. However, the habitat must be designed with the deployment/construction operation in mind, including the placement of mass shielding, the outfitting of the habitat, and possible planned or accidental depressurization of part or all of the habitat interior. This overview paper has the objectives of : (1) giving abroad view of the overall requirements and challenges of utilizing in situ materials in human-occupied habitats and supporting base facilities, and (2) to survey several types of uses that the author considers most practical. Planning for future habitats must include the maximum practical use of in situ materials. What uses are feasible and economical will depend upon base maturity, enabling technologies available for material processing, the resource investment needed to process in situ materials into the desired final product (imported mass of equipment, energy needs, human resources), and base mission, including any in situ products. The planning of in situ material use must consider both the development of specific applications and the overall base/habitat human, energy, and technological needs and resources.

Author

Construction; Space Habitats; Life Support Systems; Mission Planning; Lunar Bases; Mars Bases; Mars (Planet); Space Transportation

19990026751 Bechtel Corp., San Francisco, CA USA

Materials Transportation

Franklin, H. Andy, Bechtel Corp., USA; Workshop on Using In Situ resources for Construction of Planetary Outposts; 1998, pp. 7; In English; See also 19990026739; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche; Abstract Only; Abstract Only

The movement of materials on planetary surfaces is seen to be a challenge for all stages of developing a permanent facility. The unloading of cargo spacecraft, the deployment of cargo and materials to construction sites, and the movement of large amounts of material needed for some scenarios where in situ resources are to be recovered are all situations requiring equipment development. Adaptations of many terrestrial technologies can be expected as designers meet these challenges. Large vehicles, tracked or wheeled, tractor trains, and maglev rail systems might form the basis of a mobile vehicular approach. Pipelines, cableways, and conveyor systems are likely to be adapted for large-scale, continuous materials delivery roles. Difficulty of large-scale transportation may force a "mobile factory" approach wherein the processing facility moves over the source fields, lifting, processing, and then depositing wastes behind its track. On the other hand, large power requirements may dictate a stationary facility and hence force delivery of material resources for long distances over rugged terrain. Even in the case of large vehicles, power is likely to be provided by onboard fuel cells or batteries. The weight of these systems will decrease the effective payload of the vehicle. This

will influence the results of trade-off studies where integrated systems designs are compared. In some situations a small processing facility may be served by a series of robotic bulldozers that continuously scrape the resource material toward the fixed plant. Again, power demands and the condition of the resource material will drive the design of the transportation system. Providing simple, rugged, and reliable materials transportation systems will be the goal of designers.

Author

Construction; Industrial Plants; Payloads; Planetary Surfaces; Robotics; Tradeoffs; Transportation

19990026752 NASA Johnson Space Center, Houston, TX USA

Requirements for Planetary Outpost Life-Support Systems and the Possible Use of In Situ Resources

Gruener, John E., Hernandez Engineering, Inc., USA; Ming, D. W., NASA Johnson Space Center, USA; Workshop on Using In Situ resources for Construction of Planetary Outposts; 1998, pp. 7-8; In English; See also 19990026739; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche; Abstract Only; Abstract Only

If humans are ever to live and work on the Moon or Mars for extended periods of time, the operation of regenerative life-support systems at the planetary outposts will be a critical requirement. The substantial amount of materials consumed by humans and the inevitable waste products make open-loop life-support systems and resupply missions (as used in Space Shuttle and Mir operations) impractical and expensive. Natural resources found on the Moon and Mars could be used in conjunction with regenerative life support systems to further reduce the amount of material that would need to be delivered from Earth. There have been numerous studies and experiments conducted on the production of O from regolith materials on the Moon and from the atmosphere of Mars. One or several of these processes could undoubtedly be used to produce the O required by the crews at planetary outposts. Water is required in the greatest quantities, primarily for tasks such as personal hygiene and clothes washing, and it will be the most precious consumable. Again, several process have been described to produce water on the Moon using solar-wind implanted H and O, and if water ice can be found and mined at the lunar poles, another source of water may be available.

Author

Life Support Systems; Mars Atmosphere; Mars Surface; Moon; Water; Oxygen; Lunar Bases; Lunar Composition; Food Production (In Space); Thermal Protection; Radiation Protection

19990026764 University of Southern California, Dept. of Aerospace Engineering, Los Angeles, CA USA

In Situ Generation of a "To Scale" Extraterrestrial Habitat Shell and Related Physical Infrastructure Utilizing Minimally Processed Local Resources

Thangavelu, M., University of Southern California, USA; Khalili, N., California Inst. for Earth Art and Architecture, USA; Girardey, C., Visioneering, USA; Workshop on Using In Situ resources for Construction of Planetary Outposts; 1998, pp. 15-16; In English; See also 19990026739; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche; Abstract Only; Abstract Only

Advanced crewed lunar and Mars bases will require structurally safe and environmentally self-sustained habitats that are well protected against the vacuum or very low atmospheric pressures, very large diurnal temperature variations, harmful solar and galactic radiation, micrometeorites, and severe dust storms (on Mars). They also need to be habitable and made as safe and comfortable as possible for the crew. The architecture of such a remote base habitat entails the harmonious integration and operation of two essential and major systems: the physical structure of the enclosure and the environmental control and life-support system that will make the dwelling habitable. In Situ Resource Utilization based Stabilized Soil Technology (SST) structures that are being built here at the edge of the Mojave High Desert in Hesperia, California, promise to offer a versatile solution to these habitats and related physical infrastructure, providing highly innovative and promising solutions to critical aspects of protection, safety, and habitability issues that are paramount to the optimal long life-cycle operation of these advanced bases. From a variety of experimental structures already built, tested, and certified in Hesperia, it seems that it is quite possible to build the physical structure of the primary habitat structure itself out of local soil using special techniques that are being researched, tested, and evolved. SST habitats capable of providing thermal, micrometeoritic, and radiation protection for crew and supporting life systems with acceptable atmospheric leakage rates can be built in situ and evolved in accordance with needs as the base evolves.

Author

Environmental Control; Habitability; Life Support Systems; Lunar Bases; Mars Bases; Radiation Protection; Shelters; Lunar Shelters; Environmental Engineering

19990026767 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Ice as a Construction Material

Zuppero, Anthony, Idaho National Engineering Lab., USA; Lewis, J., Jet Propulsion Lab., California Inst. of Tech., USA; Workshop on Using In Situ resources for Construction of Planetary Outposts; 1998, pp. 18-19; In English; See also 19990026739; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche; Abstract Only; Abstract Only

This presentation shows how water and ice can enable exceptionally simple ways to construct structures in deep space. Practicality is underscored by applying advanced tank methods being developed for Mars missions. Water or ice is now known to be present or abundant on most objects in the solar system, starting with the planet Mercury. Thermal processes alone can be used to melt ice. The cold of space can refreeze water back into ice. The anomalous low vapor pressure of water, about 7 mm Hg, permits bladder containers. Tanks or bladders made with modern polymer fiber and film can exhibit very small (less than 0.1 %) equivalent tankage and ullage fractions and thus hold thousands of tons of water per ton bladder. Injecting water into a bladder whose shape when inflated is the desired final shape, such as a space vehicle, provides a convenient way to construct large structures. In space, structures of 10,000-T mass become feasible because the bladder mass is low enough to be launched. The bladder can weigh 1000 times less than its contents, or 10 T. The bladder would be packed like a parachute. Shaped memory materials and/or gas inflation could reestablish the desired structure shape after unpacking. The water comes from space resources. An example examines construction of torus space vehicle with 100-m nominal dimension. People would live inside the torus. A torus, like a tire on an automobile, would spin and provide synthetic gravity at its inner surface. A torus of order 100 m across would provide a gravity with gradients low enough to mitigate against vertigo.

Author

Construction; Extraterrestrial Resources; Ice; Large Space Structures; Spacecraft Structures; Tanks (Containers); Water Resources

19990027068 Air Force Research Lab., Human Effectiveness Directorate, Brooks AFB, TX USA

Testing and Evaluation of the Stoeckert Shiley Multiflow Roller Pump Module, 10H Series, Model 10-10-00 Final Report

Jones, Allen E.; Dec. 15, 1998; 18p; In English

Contract(s)/Grant(s): Proj-R184

Report No.(s): AD-A359614; AFRL-HE-BR-TR-1998-0080; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Stockert-Shiley, Multiflow Roller Pump is a precision peristaltic pump. It is an integral component of the Neonatal/Pediatric ECMO Transport System. The roller pump is plugged into a series bladder box, then into a modified Tripplite Isobar, then into a Topaz uninterruptible power supply (UPS), then into 115 VAC/60 Hz aircraft power. The roller pump accommodates a wide range of flow rates using different tubing diameters together with the different size tubing inserts available for the monitor. The roller pump is capable of displaying both revolutions per minute (RPM) and flow rates in liters per minute (LPM). Only LPM's should be displayed during an aeromedical evacuation ECMO Transport. The roller pump is 46.6 cm (18.3 inches) D X 18 cm (7.1 inches) W X 28.7 cm (11.3 inches) H, and weighs 25.1 Kg (55 lbs).

DTIC

Pumps; Medical Equipment; Evacuating (Transportation); Air Transportation

19990027069 Army Aeromedical Research Lab., Fort Rucker, AL USA

Helmet-Mounted Displays and Facial Injury in U.S. Army AH-64A Apache Accidents Final Report

Crowley, John S.; Jan. 1999; 7p; In English

Contract(s)/Grant(s): Proj-3O162787A878

Report No.(s): AD-A359606; USAARL-99-03; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

There is concern that the helmet display unit (HDU) used by AH-64 Apache helicopter pilots might contribute to facial injury in a crash. The U.S. Army accident database was searched for HDU-related injuries in survivable Apache accidents 1985-1995. Four aviators in three crashes sustained HDU-related injury. These involved three periorbital contusions and two minor eye injuries. There were no sequelae. This equates to an incidence of 0.57 injured individuals per 100,000 flying hours or 8.0 injured aviators per 100 survivable Class A-C accidents in which the HDU was worn. Applying these data to the projected UK Army Apache flying hour programme suggests that one HDU-related injury might be encountered approximately every 10.1 years. This estimate should be interpreted with caution. Serious injury remains a possibility due to the proximity of the HDU to the eye and face.

DTIC

Helmet Mounted Displays; Accidents; Aircraft Pilots; AH-64 Helicopter; Crashes

19990027084 Institute for Human Factors TNO, Soesterberg, Netherlands

Vibrotactile Perception: A Literature Review Final Report

vanErp, J. B. F., Institute for Human Factors TNO, Netherlands; Vogels, I. M. L. C., Institute for Human Factors TNO, Netherlands; Jul. 22, 1998; 40p; In English

Contract(s)/Grant(s): B97-031; TNO Proj. 788.1

Report No.(s): TD9-0252; TM-98-B011; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, P.O. Box 23, 3769 ZG Soesterberg, The Netherlands), Hardcopy, Microfiche

Operating a remotely piloted vehicle, flying a jet fighter, and other steering and control tasks are more and more supported by intelligent aids and displays. Traditionally, these displays involve the visual and auditory sense of the operator. Until recently, little attention is given to the possibilities of using tactile displays as aids in steering and control tasks, although displays for the tactile modality are successfully applied in, for example, reading aids for the visually handicapped. However, when visual and auditory information are degraded, or when systems become more complex, the surplus value of using the tactile modality may be present in orientation, and steering and control tasks as well. To be able to successfully design tactile displays for these applications, fundamental physiological and psychophysical knowledge of tactile perception is indispensable. Therefore, the present report presents a literature review on (vibro-) tactile perception, with emphasis on psychophysical parameters and phenomena such as detection and difference thresholds, summation and adaptation. This report is primarily meant to give an overview of relevant parameters and to serve as concise reference report. The report shows that, although different experimental methods and procedures may lead to different findings, the available data can be useful to formulate design considerations and identify possible problems. The transformation from fundamental knowledge into parameter choice and values (e.g. body locus, spatial resolution, and frequency) and other design considerations for tactile displays, will be described in another report (Van Erp & Van den Dobbelsteen, 1998).

Author

Information; Remotely Piloted Vehicles; Visual Perception; Display Devices

19990027094 Kopin Corp., Taunton, MA USA

Development of Advanced Technology for 2000 LPI Head-Mounted Displays Final Report, Jun. 1994 - Nov. 1997

Woodard, Ollie C.; Jan. 1999; 52p; In English

Contract(s)/Grant(s): MDA972-94-C-0023

Report No.(s): AD-A359938; NATICK-TR-99/014; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Operational 2560 x 2048 active matrix liquid crystal displays (AMLCD) and operational 1280 x 1024 active matrix electroluminescent displays (AMEL) were demonstrated. Manufacturing technologies were developed for high resolution active matrix displays made in both electroluminescent and liquid crystal formats, extending the state-of-the-art from 1280 x 1024 pixel (1000 lines/in) to 2560 x 2048 pixel (2000 lines/in) displays. The 2560 x 2048 displays have 12 microns pixel pitch and a 1.5 in. screen diagonal. On-board circuits, which include video decode, row and column scanners and the pixel TFT's, contain over 5,000,000 transistors-the equivalent of a large scale integrated circuit. The program provided breakthrough display technologies, which are now used in both AMEL and AMLCD display manufacturing processes. 2000 LPI displays for Head-Mounted Display applications are in development.

DTIC

Liquid Crystals; Helmet Mounted Displays; Flat Panel Displays; Manufacturing

19990027095 Institute for Human Factors TNO, Technische Menskunde, Soesterberg, Netherlands

Evaluation of the Clothing and Equipment of the Royal Netherlands Air Force Final Report Evaluatie PSU Koninklijke Luchtmacht

Kistemaker, J. A., Institute for Human Factors TNO, Netherlands; Krul, A. J., Institute for Human Factors TNO, Netherlands; Heus, R., Institute for Human Factors TNO, Netherlands; Nov. 19, 1998; 65p; In Dutch

Contract(s)/Grant(s): A97/KLu/322; TNO Proj. 789.2

Report No.(s): TD98-0273; TM-98-A061; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 de Soesterberg, The Netherlands), Hardcopy, Microfiche

The Royal Netherlands Air Force and the TNO Human Factors Research Institute developed three questionnaires to evaluate the clothing and equipment of the Royal Netherlands Air Force and to make an inventory of new clothing needs. A representative part of the wearers filled in a questionnaire on location under the supervision of the Royal Netherlands Air Force. The questionnaires were obtained from December '97 until March '98. One questionnaire dealt with the Personal Clothing & Equipment 'blauw', one questionnaire dealt with the Personal Clothing & Equipment 'woodland' and one questionnaire dealt with the functional clothing. The persons were asked to choose the questionnaire that dealt most with the clothing they usually wear. The subjects had to rate usability, size and fit, functionality, quality and comfort of the clothing. The major results are: (1) the wearers showed a general positive opinion about their clothing and equipment; (2) there are several wishes that mainly refer to poor fit for women and poor comfort in the summer; (3) 7 articles show poor results and can be considered for discarding or complete redesign (f.i. underwear, hats); (4) 14 articles show poor results, but can be improved (f.i. important articles from the DT 'blauw' and the "woodland" clothing); and (5) 3 articles are reasonably good and 10 articles are good.

Author

Clothing; Evaluation; Armed Forces (Foreign); Aircraft Equipment

19990027266 Civil Aeromedical Inst., Oklahoma City, OK USA

Performance of a Portable Oxygen Breathing System at 25,000 Feet Altitude Final Report

Garner, Robert P., Civil Aeromedical Inst., USA; Murphy Richard E., Civil Aeromedical Inst., USA; Hudgins, Chad B., Civil Aeromedical Inst., USA; Mandella, Joseph G., Jr., Civil Aeromedical Inst., USA; November 1998; 12p; In English
Report No.(s): DOT/FAA/AM-98/27; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A portable oxygen system utilizing open port dilution rebreathing mask technology was tested for its ability to deliver an adequate supply of oxygen at an altitude of 25,000 feet above sea level. Twenty-two subjects, 11 females and 11 males, participated in the study. Blood oxygen saturation (SaO₂) baseline levels for hypoxic exposure were established for each subject. Altitude testing consisted of the subject being placed in a hypobaric chamber and it being decompressed to an altitude of 25,000 feet. Immediately after the start of the decompression, the subject was instructed to don the oxygen mask and start the flow of oxygen from the portable cylinder. Oxygen flow to the mask was continuous at 4 liters per minute. Once at altitude, the subjects pedaled a cycle ergometer at a resistance of 15 watts for five minutes. SaO₂ and other physiological variables were monitored throughout the altitude exposure. SaO₂ levels were maintained at ground level values for all subjects throughout the altitude exposures. At no point during the testing did oxygenation levels approach baseline levels for hypoxic exposure. The portable oxygen system tested provided protection from hypobaric hypoxia at an altitude of 25,000 feet.

Author

Breathing Apparatus; Rebreathing; Ergometers; Hypobaric Atmospheres; Oxygen Masks

19990027303 NASA Ames Research Center, Moffett Field, CA USA

Development of the Monolith Froth Reactor for Catalytic Wet Oxidation of CELSS Model Wastes Final Report

Fisher, John W., NASA Ames Research Center, USA; Abraham, Martin, Toledo Univ., USA; 1993; 12p; In English
Contract(s)/Grant(s): NCC2-5151; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The aqueous phase oxidation of acetic acid, used as a model compound for the treatment of CELSS (Controlled Ecological Life Support System) waste, was carried out in the monolith froth reactor which utilizes two-phase flow in the monolith channels. The catalytic oxidation of acetic acid was carried out over a Pt/Al₂O₃ catalyst at temperatures and pressures below the critical point of water. The effect of externally controllable parameters (temperature, liquid flow rate, distributor plate orifice size, pitch, and catalyst distance from the distributor plate) on the rate of acetic acid oxidation was investigated. Results indicate reaction rate increased with increasing temperature and exhibited a maximum with respect to liquid flow rate. The apparent activation energy calculated from reaction rate data was 99.7 kJ/mol. This value is similar to values reported for the oxidation of acetic acid in other systems and is comparable to intrinsic values calculated for oxidation reactions. The kinetic data were modeled using simple power law kinetics. The effect of "froth" feed system characteristics was also investigated. Results indicate that the reaction rate exhibits a maximum with respect to distributor plate orifice size, pitch, and catalyst distance from the distributor plate. Fundamental results obtained were used to extrapolate where the complete removal of acetic acid would be obtained and for the design and operation of a full scale CELSS treatment system.

Author

Acetic Acid; Catalysts; Closed Ecological Systems; Life Support Systems; Oxidation; Waste Treatment

19990027735 Illinois Univ., Aviation Research Lab., Savoy, IL USA

Allocation of Attention with Head-Up Displays Final Report

Wickens, C. D., Illinois Univ., USA; Ververs, P. M., Illinois Univ., USA; Nov. 1998; 22p; In English
Contract(s)/Grant(s): DTFA-95-G-049

Report No.(s): DOT/FAA/AM-98/28; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two experiments examined the effects of display location (head up vs. head down) and image intensity/clutter on flight path performance and mid-air target detection in a general aviation cruise flight environment. In Experiment 1, a low-Fidelity simulation, both near-domain and far-domain instrumentation were presented at the same optical distance. Detection of commanded flight changes and maintenance of desired flight path flight were generally better in the head-down condition, an advantage attributed to the superior image contrast ratios in that condition. In contrast, target detection was superior with the head-up display, reflecting an attentional tradeoff. Experiment 2 was performed with pilots viewing far-domain imagery (and airborne targets) on an Evans and Sutherland display positioned near optical infinity, head-up display (HUD) imagery at the same optical distance, and head-down imagery at a near distance typical of the instrument panel. The degree of clutter was also varied and image contrast ratios were equated between head-up and head-down viewing conditions. Flight performance was equivalent between the HUD and head-down locations. However, detection of both near-domain events (commanded changes) and far-domain targets was better in the HUD condition, revealing the HUD benefit of reduced scanning. Adding extra information (clutter) to the HUD inhibited detection of both events in both head-up and head-down locations. However, this clutter cost was diminished for far-domain target

detection if the added information was "low-lighted." Flight performance was superior in clear weather, when the true horizon was available for viewing. The data provided little evidence that attention was modulated in depth (near vs. far domains), but rather suggested that attention was modulated between tasks (flight control and detection).

Author

Attention; Head-Up Displays; Target Acquisition; Flight Instruments; Human Factors Engineering; Pilot Performance

19990027759 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia

A Trial of the Suitability and Practicality of a Proposed Meal Based Ration Scale

Walker, Gaylene J., Defence Science and Technology Organisation, Australia; Forbes-Ewan, Chris, Defence Science and Technology Organisation, Australia; Carins, Julia E., Defence Science and Technology Organisation, Australia; Driver, G. E., Defence Science and Technology Organisation, Australia; Sep. 1998; 56p; In English; Sponsored in part by DGFD(L) Report No.(s): DSTO-TR-0723; DODA-AR-010-636; Copyright; Avail: Issuing Activity (DSTO Aeronautical and Maritime Research Lab., PO Box 4331, Melbourne, Victoria 3001, Australia), Hardcopy, Microfiche

This report describes a trial of a proposed new means of determining food entitlements for soldiers in barracks. The aim of the trial was to determine the suitability and practicality of meal based rationing, together with a new means of determining entitlements to food. This system of feeding is known as Attendance - Based Rationing. The proposed system has been implemented by Army as a means of increasing the efficiency of Army catering.

Author

Rations; Suitability; Provisioning

19990027848 Army Soldier and Biological Chemical Command, Soldier Systems Center, Natick, MA USA

The Effects of Multilayered Military Clothing Ensembles on Body Size: A Pilot Study Final Report, Sep. 1991 - Jun. 1998

Paquette, Steven P., Army Soldier and Biological Chemical Command, USA; Case, Henry W., Geo-Centers, Inc., USA; Annis, James F., Anthropology Research Project, USA; Mayfield, Teresa L., Anthropology Research Project, USA; Kristensen, Shirley, Anthropology Research Project, USA; Jan. 1999; 250p; In English

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This report documents an attempt to quantify the effects of multiple clothing layers on individual body size in order to provide important information to workspace designers and clothing system developers. Over 90 measurements were taken on an anthropometrically diverse sample of five men or five women. The specific clothing ensembles examined in the study include: Ground Soldier, Aviator-Warm Weather, Aviator-Cold Weather, Combat Vehicle Crewman-Warm Weather and Combat Vehicle Crewman-Cold Weather. Semi-nude measurements served as a baseline for the body size increments documented for each successive layer of the clothing ensembles. Initial and repeat measurements of all dimensions were taken in order to assess measurement reliability. In addition, differential donning effects were assessed by measuring subjects in an initial and redress condition. Recommendations for the conduct of a full-scale clothed anthropometric survey are also provided. Finally, a companion study or range of motion under the identical clothing configurations was conducted and will be presented in a separated report.

DTIC

Clothing; Body Size (Biology); Anthropometry

19990027921 Research and Technology Organization, Human Factors and Medicine Panel, Neuilly-sur-Seine, France

Alternative Control Technologies Technologies de Controle Non Conventiionnelles

Hudgins, Bernard, New Brunswick Univ., Canada; Leger, Alain, Sextant Avionique, France; Dauchy, Pierre, Institut de Medicine Aerospatiale Armee, France; Pastor, Dominique, Sextant Avionique, France; Pongratz, Hans, Flugmedizinisches Inst. der Luftwaffe, Germany; Rood, Graham, Defence Evaluation Research Agency, UK; South, Alan, Defence Evaluation Research Agency, UK; Carr, Karen, British Aerospace Public Ltd. Co., UK; Jarrett, Don, Defence Evaluation Research Agency, UK; McMillan, Grant, Armstrong Lab., USA; Anderson, Timothy, Armstrong Lab., USA; Borah, Joshua, Applied Science Labs., USA; December 1998; 148p; In English

Report No.(s): RTO-TR-7; AC/323(HFM)TP/3; ISBN 92-837-1009-6; Copyright Waived; Avail: CASI; A07, Hardcopy; A02, Microfiche

In January 1996, the Working Group 25 of the former AGARD Aerospace Medical Panel began to evaluate the potential of alternative (new and emerging) control technologies for future aerospace systems. The present report summarizes the findings of this group. Through different chapters, the various human factors issues related to the introduction of alternative control technologies into military cockpits are reviewed, in conjunction with more technical considerations of the state of the art of the enabling technologies. Cockpit integration issues are emphasized in regard to both human factors and engineering constraints.

Several specific applications of these new technologies in the aerospace environment are considered. Challenges for further developments are identified and recommendations issued. Globally, based upon operational considerations and currently recognized limitations of the Hands on Throttle and Stick (HOTAS) concept, the conclusion is that Alternative Control Technology should now be progressively introduced into the cockpit, as a function of degree of maturity of the various techniques.

Author

Aerospace Environments; Aerospace Systems; Cockpits; Human Factors Engineering; Aircraft Instruments; Adaptive Control; Automatic Flight Control; Artificial Intelligence; Fighter Aircraft; Tracking (Position); Pilots (Personnel); Human-Computer Interface

19990027961 Defence Science and Technology Organisation, Information Technology Div., Canberra Australia

Perspective Displays: A Review of Human Factors Issues

Naikar, Neelam, Defence Science and Technology Organisation, Australia; February 1998; 44p; In English

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Three-dimensional displays may be a more effective way of presenting spatial information to operators than conventional two-dimensional displays because all three dimensions of space may be represented in a spatial format. Of several three-dimensional computer graphics systems that are currently available, perspective displays may be the most viable option for implementation at the present time. Previous research shows that perspective displays support better performance than plan-view displays on navigation, spatial awareness, and integration tasks. However, several issues need to be carefully considered and understood before perspective displays may be safely operationalised. This report reviews these issues; monocular cues for depth perception, multiple cue interaction, frame of reference, perspective geometry, and geometric and symbolic enhancement features.

DTIC

Human Factors Engineering; Computer Graphics; Display Devices

19990028188 Department of Energy, Assistant Secretary for Human Resources and Administration, Washington, DC USA

Deformable human body model development

Wray, W. O., Department of Energy, USA; Aida, T., Department of Energy, USA; Dec. 31, 1998; 25p; In English

Report No.(s): DE99-000554; LA-UR-98-1872; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This is the final report of a three-year, Laboratory Directed Research and Development (LDRD) project at the Los Alamos National Laboratory (LANL). A Deformable Human Body Model (DHBM) capable of simulating a wide variety of deformation interactions between man and his environment has been developed. The model was intended to have applications in automobile safety analysis, soldier survivability studies and assistive technology development for the disabled. To date, we have demonstrated the utility of the DHBM in automobile safety analysis and are currently engaged in discussions with the U.S. military involving two additional applications. More specifically, the DHBM has been incorporated into a Virtual Safety Lab (VSL) for automobile design under contract to General Motors Corporation. Furthermore, we have won \$1.8 M in funding from the U.S. Army Medical Research and Material Command for development of a noninvasive intracranial pressure measurement system. The proposed research makes use of the detailed head model that is a component of the DHBM; the project duration is three years. In addition, we have been contacted by the Air Force Armstrong Aerospace Medical Research Laboratory concerning possible use of the DHBM in analyzing the loads and injury potential to pilots upon ejection from military aircraft. Current discussions with Armstrong involve possible LANL participation in a comparison between DHBM and the Air Force Articulated Total Body (ATB) model that is the current military standard.

NTIS

Computerized Simulation; Research and Development; Human Body; Models; Simulation

19990028216 Institute for Human Factors TNO, Soesterberg, Netherlands

Task Performance Under Fatigue: Effects of Public and Private Feedback Interim Report

Hoeksema-vanOrden, C. Y. D., Institute for Human Factors TNO, Netherlands; Gaillard, A. W. K., Institute for Human Factors TNO, Netherlands; Langefeld, J. J., Institute for Human Factors TNO, Netherlands; May 15, 1998; 22p; In English

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This is the sixth experiment in a series of studies on the effects of fatigue and sleep deprivation on task performance. Participants worked on three different individual tasks for 20 hours without sleep, in five sessions of four hours each. In the current experiment, the main research question concerned feedback: which type of feedback motivates people the best when they have to work

such long hours without sleep? Two types of feedback were tested: (1) 'private feedback', on the individual performance only; (2) 'public feedback', on all participants' performance. An interaction between feedback and fatigue was expected, in the sense that public feedback was expected to be a better motivator over time than private feedback. On one task it was indeed found that participants with public feedback performed better than those with private feedback, but this was the case right from the start. No evidence was found for an interaction between feedback and fatigue. Apparently, just the knowledge that one's performance will be made public to all other participants, motivates people to work hard, beforehand. Comparisons with previous experiments revealed some suggestions concerning the organization of continuous work during night hours: such work should preferably take place in a group setting where social control can play a role of importance. Group work should be combined with a substantial degree of individual responsibility of each group member for the outcome.

Author

Experimentation; Research; Feedback; Human Performance

Subject Term Index

A

ABSTRACTS, 4
ACCELERATION TOLERANCE, 6
ACCIDENTS, 11
ACETIC ACID, 13
ADAPTIVE CONTROL, 15
AEROSPACE ENVIRONMENTS, 15
AEROSPACE MEDICINE, 5
AEROSPACE SYSTEMS, 15
AH-64 HELICOPTER, 11
AIR TRANSPORTATION, 11
AIRCRAFT EQUIPMENT, 12
AIRCRAFT INSTRUMENTS, 15
AIRCRAFT PILOTS, 11
ANIMALS, 2
ANTHROPOMETRY, 14
ARMED FORCES, 8
ARMED FORCES (FOREIGN), 12
ARTIFICIAL INTELLIGENCE, 15
ATTENTION, 14
AUTOMATIC FLIGHT CONTROL, 15

B

BIBLIOGRAPHIES, 5
BIOCHEMISTRY, 2
BIOENGINEERING, 2
BIOSYNTHESIS, 3
BLOOD, 5
BODY SIZE (BIOLOGY), 14
BORING MACHINES, 8
BREATHING APPARATUS, 13

C

CALIBRATING, 5
CARBON MONOXIDE, 5
CARBOXYHEMOGLOBIN, 5
CATALYSTS, 2, 13
CHEMICAL COMPOSITION, 1
CHEMICAL ENGINEERING, 2
CHROMOSOMES, 4
CLONING (BIOLOGY), 3
CLOSED ECOLOGICAL SYSTEMS, 13
CLOTHING, 12, 14
COCKPITS, 7, 15
COGNITIVE PSYCHOLOGY, 2
COMPUTER GRAPHICS, 15
COMPUTERIZED SIMULATION, 15

CONFERENCES, 4
CONSTRUCTION, 9, 10, 11
CONSTRUCTION MATERIALS, 1, 9
CRASHES, 11

D

DATA ACQUISITION, 8
DATA BASES, 5, 8
DEOXYRIBONUCLEIC ACID, 3, 4
DIAGNOSIS, 6
DISPLAY DEVICES, 7, 12, 15

E

EAR, 7
EMBRYOS, 4
ENVIRONMENTAL CONTROL, 10
ENVIRONMENTAL ENGINEERING, 10
ENZYMES, 2
ERGOMETERS, 13
ESCHERICHIA, 2
EVACUATING (TRANSPORTATION), 11
EVALUATION, 12
EXPERIMENTATION, 16
EXTRATERRESTRIAL RESOURCES, 9, 11

F

FAILURE, 7
FEEDBACK, 16
FEMALES, 6
FIGHTER AIRCRAFT, 15
FLAT PANEL DISPLAYS, 12
FLIGHT CHARACTERISTICS, 7
FLIGHT INSTRUMENTS, 14
FLIGHT TRAINING, 8
FOOD PRODUCTION (IN SPACE), 10

G

GENE EXPRESSION, 4
GENES, 3, 4
GENETICS, 2, 4
GLASS, 1
GRAVITROPISM, 2

H

HABITABILITY, 10
HEAD-UP DISPLAYS, 14
HEALTH, 6
HELMET MOUNTED DISPLAYS, 11, 12
HUMAN BODY, 15
HUMAN FACTORS ENGINEERING, 14, 15
HUMAN PERFORMANCE, 16
HUMAN TOLERANCES, 6
HUMAN-COMPUTER INTERFACE, 15
HYPOBARIC ATMOSPHERES, 13

I

ICE, 9, 11
INDEXES (DOCUMENTATION), 5
INDUSTRIAL PLANTS, 10
INFORMATION, 12
INFORMATION DISSEMINATION, 3
INJURIES, 2

L

LARGE SPACE STRUCTURES, 11
LIFE SUPPORT SYSTEMS, 6, 9, 10, 13
LIQUID CRYSTALS, 12
LUNAR BASES, 9, 10
LUNAR COMPOSITION, 10
LUNAR SHELTERS, 10
LUNAR SOIL, 1
LUNAR SURFACE, 1

M

MANAGEMENT, 8
MANUFACTURING, 12
MARS (PLANET), 8, 9
MARS ATMOSPHERE, 10
MARS BASES, 8, 9, 10
MARS SURFACE, 10
MEDICAL EQUIPMENT, 6, 11
MELTING, 8
MISSION PLANNING, 9
MODELS, 15
MOLECULAR BIOLOGY, 4
MOLECULAR STRUCTURE, 4
MOON, 1, 10

MULTIDISCIPLINARY RESEARCH, 2
MUTATIONS, 2

N

NAVY, 6
NEUROLOGY, 2
NEUROPHYSIOLOGY, 2

O

OPERATIONS RESEARCH, 6
OXIDATION, 13
OXIMETRY, 5
OXYGEN, 10
OXYGEN MASKS, 13

P

PAYLOADS, 10
PERFORMANCE PREDICTION, 7
PHARMACOLOGY, 2
PHOTOTROPISM, 2
PHYSIOLOGICAL FACTORS, 6
PILOT PERFORMANCE, 14
PILOTS (PERSONNEL), 15
PLANETARY COMPOSITION, 8
PLANETARY SURFACES, 10
PLANTS (BOTANY), 2, 3, 4
PREVENTION, 6
PROBABILITY THEORY, 8
PROPELLANTS, 9
PROTEINS, 4
PROVISIONING, 14
PUMPS, 11

R

RADIATION PROTECTION, 10
RADIATION SHIELDING, 8
RADIO COMMUNICATION, 3, 4
RATIONS, 14
REBREATHING, 13
REMOTELY PILOTED VEHICLES, 12
RESEARCH, 2, 7, 16
RESEARCH AND DEVELOPMENT, 15
ROBOTICS, 10

S

SCORING, 8
SEEDS, 4
SEQUENCING, 3

SHELTERS, 10
SIMULATION, 15
SINTERING, 1
SMOKE, 6
SPACE HABITATS, 9
SPACE TRANSPORTATION, 9
SPACECRAFT PROPULSION, 9
SPACECRAFT STRUCTURES, 11
SPECTROPHOTOMETRY, 5
STARCHES, 2
STATISTICAL DECISION THEORY, 8
SUITABILITY, 14
SYSTEM FAILURES, 7

T

TANKS (CONTAINERS), 11
TARGET ACQUISITION, 14
TELEMEDICINE, 6
TELEOPERATORS, 6
THERMAL PROTECTION, 10
THREE DIMENSIONAL MODELS, 7
TRACKING (POSITION), 15
TRADEOFFS, 10
TRANSPORTATION, 9, 10
TUNNELING (EXCAVATION), 8

U

UNDERGROUND STRUCTURES, 8

V

VEGETATION GROWTH, 4
VISUAL PERCEPTION, 12

W

WARNING SYSTEMS, 7
WASTE TREATMENT, 13
WATER, 1, 9, 10
WATER RESOURCES, 11

Pesonal Author Index

A

Abraham, Martin, 13
Aida, T., 15
Anderson, Timothy, 14
Annis, James F., 14
Arnold, F. H., 2
Austria, N., 3

B

Blacic, James D., 8
Blacic, T. M., 8
Blower, David J., 7
Borah, Joshua, 14
Buehler, David, 8

C

Canfield, Dennis V., 5
Carins, Julia E., 14
Carr, Karen, 14
Case, Henry W., 14
Chaturvedi, Arvind K., 5
Chernova, T., 3
Conway, Terry L., 6
Criswell, Marvin E., 9
Crowley, John S., 11

D

Dauchy, Pierre, 14
Driver, G. E., 14

F

Fisher, John W., 13
Forbes-Ewan, Chris, 14
Franklin, H. Andy, 9

G

Gaillard, A. W. K., 15
Galau, G., 4
Garner, Robert P., 13
Girardey, C., 10
Gruener, John E., 10

H

Heus, R., 12
Hoeksema-vanOrden, C. Y. D., 15
Houts, Mike G., 8
Hudgins, Bernard, 14
Hudgins, Chad B., 13

J

Jarrett, Don, 14
Jones, Allen E., 11

K

Khalili, N., 10
Kistemaker, J. A., 12
Kristensen, Shirley, 14
Krul, A. J., 12

L

Langefeld, J. J., 15
Ledley, Robert S., 2
Leger, Alain, 14
Lewis, J., 10

M

Malmberg, R. L., 3
Mandella, Joseph G., Jr., 13
Mayfield, Teresa L., 14
McMillan, Grant, 14
Ming, D. W., 10
Mun, Seong K., 5
Murphy Richard E., 13

N

Naikar, Neelam, 15
Nichols, B. P., 3

O

Oving, A. B., 6, 7

P

Paquette, Steven P., 14
Pastor, Dominique, 14
Pongratz, Hans, 14

R

Ritter, Roxane M., 5
Rood, Graham, 14

S

Sack, Fred D., 1
Shevchenko, Vladislav V., 1
Smith, Moraine D., 5
Solomon, J. E., 4
South, Alan, 14

T

Thangavelu, M., 10

V

vanBreda, L., 7
vanErp, J. B. F., 11
Veltman, J. A., 6
Ververs, P. M., 13
Viswanathan, V. K., 3
Vogels, I. M. L. C., 11

W

Walker, Gaylene J., 14
Webb, James T., 6
Werkhoven, P. J., 7
Wertheim, A. H., 6
Whitman, W. B., 2
Wickens, C. D., 13
Woodard, Ollie C., 12
Wray, W. O., 15

Z

Zuppero, Anthony, 10

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